"NOTA" in each question denotes "None Of These Answers"

1. Two positive integers are chosen randomly. What is the probability that their product is even?

  A. $\frac{1}{2}$ B. $\frac{1}{4}$ C. $\frac{3}{4}$ D. Cannot be determined   E. NOTA

2. What is the probability of two mutually exclusive events A and B both occuring?

  A. 0   B. $\frac{1}{2}$ C. 1   D. Cannot be determined   E. NOTA

3. The probability that any person entering GAP store #1472 is female is $\frac{2}{3}$. One rainy day the store only attracts 3 customers. If the probability that no two consecutive people who entered were the same sex is expressed as $\frac{P}{Q}$, where P and Q are relatively prime, find $Q - P$.

  A. 21   B. 19   C. 11   D. 7   E. NOTA

4. Find the probability that a distinguishable permutation of the letters of the word "BANANA" has adjacent N's.

  A. $\frac{1}{144}$ B. $\frac{1}{72}$ C. $\frac{1}{15}$ D. $\frac{1}{12}$ E. NOTA

5. Rachel throws 2 darts at a dartboard, aiming for the center. The 2nd dart lands farther from the center than the 1st. If Rachel now throws another dart at the board, aiming for the center, what is the probability that this 3rd throw is also worse (i.e. farther from the center) than her 1st? Assume Rachel's skillfulness is constant.

  A. $\frac{1}{3}$ B. $\frac{1}{2}$ C. $\frac{2}{3}$ D. Cannot be determined   E. NOTA

6. Find the probability that a random integer on $[1, 10^n]$ contains a 7.

  A. $\frac{1}{10}$ B. $\frac{10^n - 9^n}{10^n}$ C. $\frac{10^{n-1} + 9^{n-1}}{10^n}$ D. $\frac{9^n}{10^n}$ E. NOTA

7. If the probability of obtaining a full house when dealt 5 cards from a standard 52-card deck is expressed as $\frac{x}{_{52}C_5}$, find x.

  A. 2808   B. 3744   C. 22981   D. 267696   E. NOTA

8. For events E and F, $P(E) = \frac{3}{13}$, $P(F) = \frac{5}{13}$, and $P(E \cup F) = \frac{6}{13}$. Find $P(F|\bar{E})$.

  A. $\frac{3}{10}$ B. $\frac{50}{169}$ C. $\frac{5}{13}$ D. $\frac{1}{2}$ E. NOTA

9. What is the probability that the product of the numbers shown face up on two dice is a composite number, if no die shows just 1 dot?

  A. 0   B. $\frac{1}{4}$ C. $\frac{1}{2}$ D. $\frac{3}{4}$ E. NOTA

10. Dena, Courtney, and Leigh Ann are 3 young women each looking to find a significant other. There are 5 young men that the girls are considering dating. If the potential couples must have the same zodiac sign, find the probability, to the nearest thousandth, that at least one match will be made. Assume that it is equally likely to have any of the 12 zodiac signs.

  A. 0.647   B. 0.729   C. 0.784   D. 0.802   E. NOTA

11. Sets A and B are both defined as {1,2,3,4,5}. If one number is picked from each set, what is the tenth's digit of the probability that their sum is greater than 4?

  A. 6   B. 7   C. 8   D. 9   E. NOTA

12. Which of the following intervals includes the percentile of a statistic lying 1 standard deviation above the mean in a normal distribution?

  A. $(60\%, 70\%)$ B. $(70\%, 80\%)$ C. $(80\%, 90\%)$ D. $(90\%, 100\%)$ E. NOTA

13. In the game show "Let's Make a Deal," you are given the choice of 3 doors. Behind 1 door is a car, and behind the other 2 doors are goats. Suppose you pick door #1, and the host opens door #2 to reveal one of the goats. You are then given the opportunity to switch doors. Given that finding the car is your optimal payoff, what is your best strategy?

  A. Stay with door #1
  B. Switch to door #2
  C. Switch to door #3
  D. Choose either door #1 or #3 - both are equally likely to reveal the car
  E. NOTA

14. Find the probability that each person in a group of 365 has a different birthday. Assume birthdays are random and that no one's birthday is on February 29th.

  A. $\frac{364!}{365^{365}}$ B. $\frac{364!}{365^{364}}$ C. $\frac{1}{365}$ D. $\frac{1}{364}$ E. NOTA

15. Suppose that it rains on exactly 2 random days each week in Seattle, WA. In any given 6 week period, what is the probability, to the nearest thousandth, that there are at least 2 consecutive weeks in Seattle where it rains on both Saturday and Sunday? Assume that the week starts on a Monday.

   A. 0.005   B. 0.008   C. 0.011   D. 0.014   E. NOTA

16. A patient is at high-risk of getting breast cancer ($h\%$ chance/year). She is considering getting a preventative mastectomy, which should reduce her risk of getting breast cancer to $\frac{h}{10}\%$ chance/year. How many times as likely would the patient get cancer in the next 2 years without a mastectomy as opposed to with one?

   A. 10   B. 100   C. $\frac{10-5h}{1-h}$ D. $\frac{200-100h}{20-h}$ E. NOTA

17. In a horse race, the odds are 6:1 against "Captain Steve" placing. In another race, the odds are 11:1 against "Fantastic Light" placing. What is the probability that neither horse places?

   A. $\frac{11}{14}$ B. $\frac{21}{25}$ C. $\frac{25}{33}$ D. $\frac{32}{33}$ E. NOTA

18. If $f(x) = \tan x$, and a real value of x is chosen at random on the interval $(\frac{-5\pi}{2}, \frac{3\pi}{2})$, find the probability that $|f(x)| < 1$.

   A. $\frac{1}{2\pi}$ B. $\frac{1}{4}$ C. $\frac{1}{\pi}$ D. $\frac{1}{2}$ E. NOTA

19. What is the probability that a randomly chosen whole number less than 10 is prime?

   A. $\frac{3}{10}$ B. $\frac{1}{3}$ C. $\frac{2}{5}$ D. $\frac{4}{9}$ E. NOTA

For questions 20 and 21, assume that you are taking a 30-question test similar to this one. For each correct answer, your score increases by 4, and for each incorrect answer, your score decreases by 1. Assume that each answer choice is equally likely to be correct in any question of the test.

20. Suppose that you guess randomly on every question. Find n if the probability of obtaining a score of n, to the nearest thousandth, is 0.154.

   A. -5   B. 0   C. 5   D. 10   E. NOTA

21. What is the probability that an integer randomly selected from $[-30, 120]$ represents an unattainable score?

  A. $\frac{5}{151}$ B. $\frac{1}{30}$ C. $\frac{6}{151}$ D. $\frac{1}{25}$ E. NOTA

22. Aaron is making a pizza and has 4 toppings available: pepperoni, mushrooms, onions, green peppers. He can choose to use any number of toppings he wishes. If any of the combinations Aaron chooses are equally likely, what is the probability that his pizza will have onions on it?

  A. $\frac{1}{4}$ B. $\frac{1}{3}$ C. $\frac{7}{15}$ D. $\frac{8}{15}$ E. NOTA

23. Find the probability that a random point selected on the circle $x^2 + y^2 = 4$ lies inside the rectangle defined by vertices $(-1, 2)$, $(1, 2)$, $(1, -2)$, and $(-1, -2)$.

  A. $\frac{1}{6}$ B. $\frac{1}{4}$ C. $\frac{1}{3}$ D. $\frac{1}{2}$ E. NOTA

24. In the NFL, a player is listed as "probable" if he has a 75% chance of starting that week. If the entire first-string offense and defense (22 players) of the Tampa Bay Buccaneers are listed as "probable," find the probability, to the nearest tenth, that at least 14 of the first-string players will start that week.

  A. 0.6   B. 0.7   C. 0.8   D. 0.9   E. NOTA

25. Suppose the probability distribution function of a uniform random variable is defined as $f(x) = \frac{1}{2N}$ on $[0, N^3]$. Find N.

  A. $\frac{1}{2}$ B. $\frac{\sqrt{2}}{2}$ C. $\sqrt{2}$ D. 2   E. NOTA

26. A biased coin has probability .4 of turning up tails. If flipped 3 times, find the probability that at most 2 heads will appear.

  A. $\frac{36}{125}$ B. $\frac{54}{125}$ C. $\frac{98}{125}$ D. $\frac{117}{125}$ E. NOTA

27. Alana has 3 red, 3 orange, and 4 blue M&M's. Alex has 5 red, 2 orange, and 3 blue M&M's. Alana picks one M&M at random to give to Alex, but Alex, happy with his original combination, gives one back to Alana. However, Alex is not sure that he gave the same color back that Alana gave to him. What is the hundredth's digit of the probability that Alex gave back an M&M of the same color?

  A. 9   B. 6   C. 3   D. 0   E. NOTA

28. A survey of 200 Mu Alpha theta students revealed the following:

- 115 planned to apply to a private university
- 160 planned to apply to a state university
- 50 planned to work after graduating high school
- 15 planned to work and apply to a private university
- 38 planned to work and apply to a state university
- 100 planned to apply to both private and state universities
- 12 planned to work and apply to both private and state universities

If one of the surveyed students is selected at random, what is the probability that he/she did not plan to work or apply to any university?

  A. 0.08   B. 0.10   C. 0.12   D. 0.16   E. NOTA

29. In a 7-digit phone number, if each of the digits is random, and any digit can be used in any position, what is the probability that all the digits are consecutive integers? (e.g. 987-6543)

  A. $\frac{8}{10^7}$ B. $\frac{6}{10^7}$ C. $\frac{4}{10^7}$ D. $\frac{3}{10^7}$ E. NOTA

30. Venus Williams, a top-ranked tennis player, gets 75% of her 1st serves in, and 90% of her 2nd serves in. She wins 80% of the points when she gets her 1st serve in, but only 35% of points when her 2nd serve goes in. When Venus wins a point on her serve, what is the probability that it was on her 1st serve?

  A. $\frac{3}{5}$ B. $\frac{8}{11}$ C. $\frac{48}{55}$ D. $\frac{160}{181}$ E. NOTA